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Wastewater Utility Recordkeeping, Reporting and Management Information Systems

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Wastewater Utility Recordkeeping, Reporting and Management Information Systems

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This purpose of this guidance document is to provide guidance for wastewater utility managers on recordkeeping and management systems. This information is essential to managing a utility to assure sustained acceptable performance at minimal cost.

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18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES 88
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WASTEWATER UTILITY RECORDKEEPING, REPORTING AND MANAGEMENT INFORMATION SYSTEMS

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I. Introduction

A. Background

The last twenty-five years have witnessed an enormous increase in the number of publicly owned treatment works (POTWs) throughout the country. This is due principally to grants which have been the source of construction funding to help clean up our nation's waterways. Many wastewater treatment plants are large, capital intensive, and highly sophisticated. As such, they present the owners with a range of problems, some of which have few precedents. Solutions to these problems demand timely and accurate information.

Wastewater problems can be divided roughly into two categories; engineering and management. The engineering problems have been dealt with in a variety of publications from both the public and private sectors. Management problems, however, have been largely ignored. This has contributed to a public perception of wastewater utility managers as lacking proper control, incapable of planning effectively, and not wanting to resolve problems. This poor public image makes effective management even more difficult. Many problems with technical symptoms actually are rooted in poor management practices. It is only in relatively recent times that wastewater treatment has been managed as a self-supporting utility. The three basic management objectives for wastewater utilities are:

- To provide quality wastewater treatment and readily disposable by-products;
- To operate wastewater treatment facilities and works in an efficient manner; and
- To operate the wastewater treatment function as a self-sustaining utility.

The ability to plan, operate and control a wastewater utility efficiently depends on the type of information available to the utility manager. Management information is usually in the form of reports prepared from operating statistics or data. It is important to understand the distinction between DATA and management INFORMATION.

DATA is generally comprised of statistics arranged in some logical manner.

Management INFORMATION is a tracking or combination of various data arranged in a comparative format.

As more treatment facilities become operational and existing facilities grow older, the need for better management systems becomes increasingly evident. To meet this need, EPA has developed a series of Management Assistance Documents. This series reflects the established principle that the independent, financially self-supporting, utility organization is the best possible framework for a well managed wastewater treatment operation. The various parts of this document are intended to familiarize the municipal manager with the recordkeeping and management information aspects of self supporting utility management.

B. Target Audience

This Utility Recordkeeping, Reporting and Management Information Systems document is designed for use by both treatment works and municipal management personnel.

Principal users include:

- Town/City Managers,
- Town/City Financial Directors,
- Utility Directors,
- Public Works Directors,
- Plant Superintendents, and
- Chief Operators.

Additionally, management consultants can use the guidance in evaluating and establishing recordkeeping and management information systems for wastewater utilities.

C. Objective

The purpose of this guidance document is to provide guidance for wastewater utility managers on recordkeeping and management systems. This information is essential to managing a utility to assure sustained acceptable performance at minimal cost.

D. Scope

This document addresses the various aspects of wastewater treatment utility management and its information needs. It gives examples of reports and record keeping forms. It addresses the various aspects of record keeping as applied to the management of utilities and explains impacts of record-keeping on operation. In addition this document presents an approach to the development of appropriate management information systems to meet local needs. Thus, alternative systems are defined, types of software discussed, and selection processes presented.

This document is written to allow an individual with general management abilities to both develop and control the development of a management information system.

E. Overview

The five functions of management are:

- o Planning
- o Organizing
- o Staffing
- o Directing
- o Controlling

None of these functions can be properly carried out without timely and accurate information for example:

- o Long range planning cannot be carried out without good information regarding the quality of the physical plant; financial plans cannot be prepared without sound information regarding the utility's financial status, etc.

- o The various activities of the utility cannot be organized, or reorganized, without an information system that alerts the manager to problems.

- o Proper staff decisions cannot be made without good information regarding the qualifications of the present staff.

- o Directing requires a base of sound historical information regarding the utility.

- o Controlling, more than the other functions, requires thorough and timely information to permit an evaluation of current position and redirection if required.

This guidance identifies some of the major wastewater utility recordkeeping, reporting and management information systems used by a properly managed utility. These systems will be discussed separately for the following wastewater utility functions:

Facility Management

- o Operations Management
  - -Monitoring and Sampling
  - -Laboratory
  - -Process Control
  - -Recordkeeping and Reporting

- o Maintenance Management
  - -Asset Management
  - -Inventory and Control
  - -Records and Monitoring

- Energy Management
- Sludge Management

Support Services

- Purchasing
- Scheduling
- Inventory Management
- Personnel
- Safety

Finance and Accounting

- Intenal Controls
- Chart of Accounts
- Accounting Records
- Interim Financial Reports
  - -Balance Sheet
  - -Revenue and Expense Statements
  - -Expenditure Tracking
  - -Cash Flow Analysis
  - -Changes in Financial Position

In Chapter V, these diverse recordkeeping elements are integrated into a management information system (MIS). Exhibit I shows how these various data sources are utilized to support the system.

II. Facility Management

Wastewater treatment facility management systems include operations, maintenance, energy and solids handling. This chapter focuses on preparation of operating reports, equipment identification, parts inventory and control systems, and controlling energy and sludge disposal costs.

A. Operations Management

Of the various utility management functions, operations has the most direct and immediate impact on the overall utility objective, i.e., to reduce pollutants in municipal wastewater to the prescribed effluent quality level and to dispose of the residuals in an environmentally safe manner.

Utility operations include supervision, monitoring and control of the various wastewater activities and the achievement of required levels of water quality in an efficient and consistent manner. For each of these activities the key elements for effective operations management include adequate management controls.

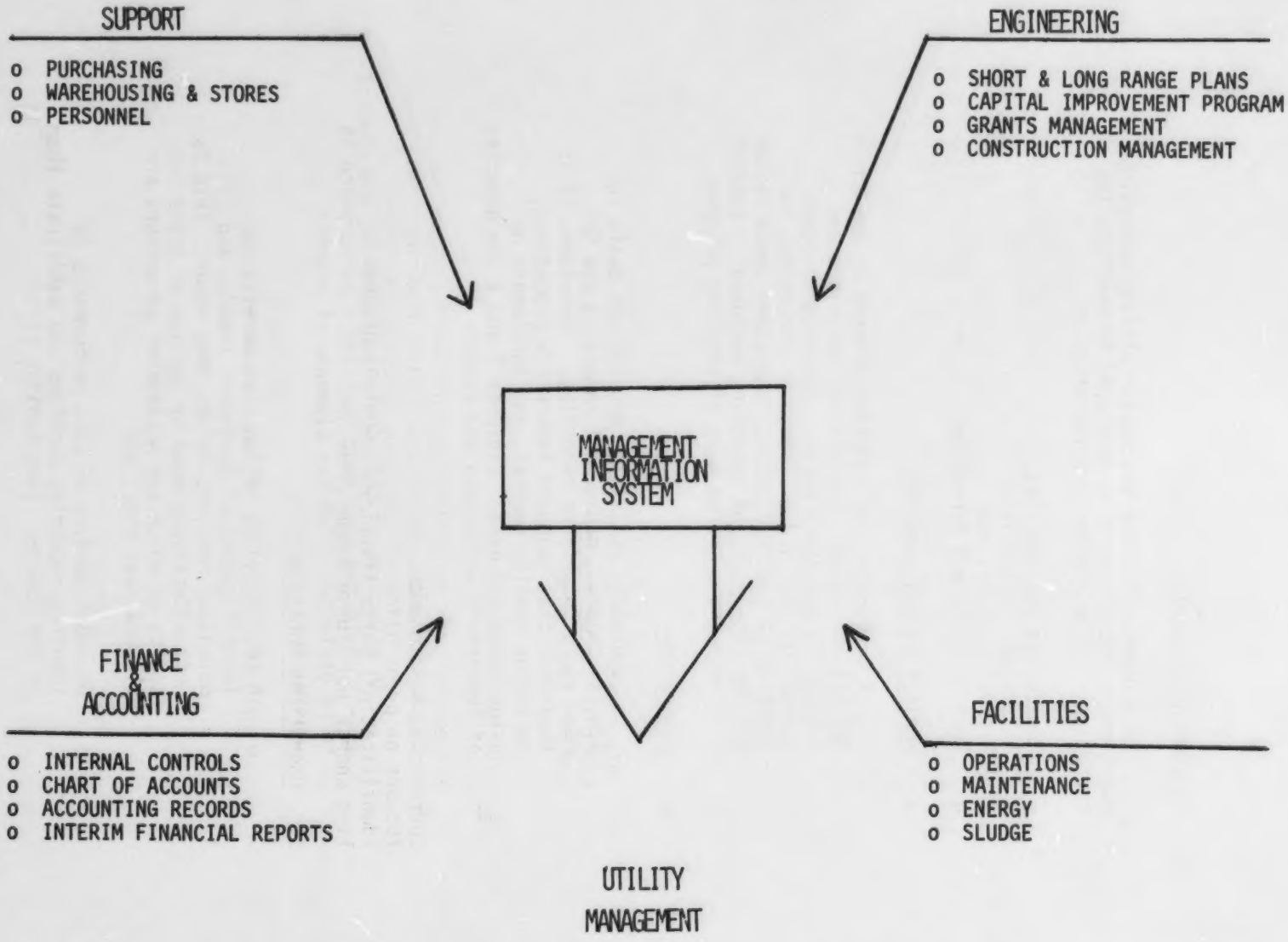

SUPPORT
o PURCHASING
o WAREHOUSING & STORES
o PERSONNEL
ENGINEERING
o SHORT & LONG RANGE PLANS
o CAPITAL IMPROVEMENT PROGRAM
o GRANTS MANAGEMENT
o CONSTRUCTION MANAGEMENT
MANAGEMENT INFORMATION SYSTEM
FINANCE & ACCOUNTING
o INTERNAL CONTROLS
o CHART OF ACCOUNTS
o ACCOUNTING RECORDS
o INTERIM FINANCIAL REPORTS
FACILITIES
o OPERATIONS
o MAINTENANCE
o ENERGY
o SLUDGE
UTILITY MANAGEMENT

EXHIBIT I

1. Management Controls

To achieve effective wastewater utility operations, management controls must be developed to regulate the processes. These require consideration of:

- o Monitoring and Sampling
- o Laboratory Capabilities
- o Process Control, and
- o Recordkeeping and Reporting.

a. Monitoring and Sampling

A monitoring and sampling program is the basis for all subsequent conclusions, decisions and actions in process control. The program scope depends on the type of treatment processes, the location of the facilities, laboratory capabilities and the capability of operating personnel. Exhibit 2 is an example of one type of sampling program.

b. Laboratory

Laboratory activities provide the basis for process control, management reporting and for regulatory compliance reporting. Therefore, it is important that standard laboratory procedures, including quality control, and worksheets be established and used. Exhibits 3 and 4 are examples of laboratory worksheets and reports.

c. Process Control

An effective process control program is essential if the treatment facility's performance is to be optimized. Two key elements of process control are:

- o A recordkeeping system that permits the identification of long-term trends, and potential problems before they occur. This is most effectively done by the use of trend charts on which key wastewater parameters are plotted over time, and
- o An understanding of past performance to identify recurring problems and anticipate them in the future. (see Exhibit 5)

SAMPLE LABORATORY TESTING PROGRAM

	SETTLEABLE SOLIDS	SUSPENDED SOLIDS	BOD	CHLORINE RESIDUAL	GREASE	TOTAL DISSOLVED SOLIDS	COLIFORM ORGANISMS	VOLATILE SUSPENDED SOLIDS	DISSOLVED OXYGEN	TOTAL SOLIDS	TOTAL VOLATILE SOLIDS		
RAW SEWAGE	C / D	C / D	C / D			C / W		C / D		C / W	C / W		
PRIMARY EFFLUENT	C / D	C / D	C / D					C / D		C / W	C / W		
SECONDARY EFFLUENT	C / D	C / D	C / D		C / W			C / D		C / W	C / W		
CHLORINE CONTACT TANK				G / *									
MIXED LIQUOR		C / D											
PLANT EFFLUENT			C / W	G / D_2		C / W	G / W		G / D				

LEGEND:

TYPE OF SAMPLE
C - COMPOSITE SAMPLE
G - GRAB SAMPLE
* EVERY 4-HOURS

FREQUENCY
D - DAILY
W - WEEKLY
D_2 - TWICE DAILY

TYPE OF SAMPLE / FREQUENCY

EXHIBIT 2

DAILY LABORATORY RECORD/REPORT

GRAB SAMPLE	INFL.	Prim. Eff.	Trickler	Final		
TIME						
COLOR						
TEMP.						
pH						
Settleable Solids, ml/l.						
Dissolved Oxygen, mg/l.						
Residual Chlorine, mg/l.						

COMPOSITE, 24 hr.					
START/STOP					
COLOR					
pH					
Sett. Solids, ml/l.					
TSS, mg/l.					
VSS, mg/l.					
5-DAY B.O.D., mg/l.					
% B.O.D. Removal					
Total Phosphate, mg/l. P					
Ammonia, mg/l N					
Turbidity, NTU					
Alkalinity, mg/l. as $CaCO_3$					

DATE _____

FLOW: Max. _____ Min. _____ Total _____

Weather _____ Air Temp. _____ Precipitation _____

DIGESTER pH _____ CO_2 ____ O_2 _____ CH_4 _____

ALKALINITY _____ mg./l. as $CaCO_3$

VOLATILE ACIDS _____ mg./l. as HOAc

Sample							
% Solids							
%Volatile							
pH							

Chemical	Amt. in Storage	Amt. used/24 hr.	Dose, mg/l

AERATION TANKS

TANK	1	2	3	Average
MLTSS, mg/l				
MLVSS, mg/l				
SSV, ml/l 5 min. 15 min. 30 min. 60 min.				
SVI, ml/g				
cent. vol., ml.				
cent. factor				
pH				
sup. turbidity				
RSTSS, mg/l				
cent. vol., ml.				
cent. factor				
S. B. D., ft.				

Inventory, lbs. Wasting, gal. lbs. MCRT

EXHIBIT 3

BOD WORK SHEET

Date In _____

Date Out _____

Sample	Bottle No.	Sample Volume	Dilution[1] Factor	Initial DO (mg/l)	Final DO (mg/l)	Seed[2] Correction	DO Change[3] (mg/l)	BOD[4] (mg/l)

TREND CHART
Month of May
Dissolved Oxygen in Aeration Tank
Composite Average

10

EXHIBIT 5

d. Recordkeeping and Reporting

Recordkeeping and reporting of operating conditions are essential tools for operators and managers to control the facility and satisfy compliance reporting requirements.

Daily logs should be maintained for each unit process. Each shift, as it begins duty, and the Chief operator should review these logs to identify short-term process problems. Exhibit 6 is an example of a daily report for a particular unit process. A summary of each unit process log should be entered in a utility daily report as illustrated by Exhibit 7. This becomes a permanent record of the routine operations of the facility.

Daily reports may contain a wide variety of factual information in addition to actual operating data from the unit process logs. These data might concern equipment failures, laboratory results, energy consumption, weather conditions, bypassing of operations, complaints and facility visitors. Monthly and annual reports should be prepared for submission to regulatory agencies and utility management.

B. Maintenance Management

Maintenance has become an increasingly significant function within wastewater facility management. With the need for higher levels of wastewater treatment, the technologies required to achieve these levels have become increasingly complex. This has resulted in the need for a systematic and comprehensive maintenance program not only to keep the plant operating efficiently without interruptions to the treatment process, but also to preserve the substantial capital investment in equipment, structures and control systems.

The elements of an effective maintenance program include:

- o Asset management,
- o Inventory and control, and
- o Records and monitoring system.

1. Asset Management

Records should be established and maintained for each piece of equipment and property. This record system should include:

- o Equipment description,

EXHIBIT 6

DAILY DIGESTERS REPORT

DATE.....19.....

OPERATOR	11 – 7		7 – 3		3 – 11	
	NAME		NAME		NAME	
Gas C. F. Storage						
Gas Production Meter						
Gas To Engines Meter						
Gas To Waste Meter						
Temp.	Prim.	Sec.	Prim.	Sec.	Prim.	Sec.
Sec. Sludge Level	Ft.	In.	Ft.	In.	Ft.	In.
Cover Pos. Sec.	Ft.	In.	Ft.	In.	Ft.	In.
Cover Pos. Prim.	Ft.	In.	Ft.	In.	Ft.	In.
Jacket Water Temp.	In	Out	In	Out	In	Out
Sludge Temp.	In	Out	In	Out	In	Out

Remarks –

EXHIBIT 7

DAILY UTILITY OPERATING REPORT

PLANT INFLUENT FLOW METER			RETURN SLUDGE	WASTE SLUDGE	AIR SUPPLIED
FINAL					
INITIAL					
TOTAL					
GAS PRODUCED		USED	SLUDGE PUMPED	HEAT EXCHANGER TEMPERATURE	DIGESTER TEMPERATURE
FINAL				IN ____°F	____°F
INITIAL				OUT ____°F	
TOTAL					

HOUR	D. O.	Cl_2 RES.

CHLORINE USED	
FINAL	
INITIAL	____
TOTAL	
BLOWER NO. 1	
FINAL	
INITIAL	____
TOTAL	
BLOWER NO. 2	
FINAL	
INITIAL	____
TOTAL	

SVI	
MLSS	

REMARKS: 1ST SHIFT

DESCRIPTION	QUANTITY
SCREENINGS	
GRIT	
SCUM	

AIR TEMP. ____°F

SEWAGE TEMP. ____°F

CHECKLIST			
AIR COMP.		SPRAY PUMPS	
BLOWERS		GAS COMP.	
GAS LINES		HEAT EXCH.	

WEATHER:

OPERATOR:

DATE:

PLANT INFLUENT FLOW METER			RETURN SLUDGE	WASTE SLUDGE	AIR SUPPLIED
FINAL					
INITIAL					
TOTAL					
GAS PRODUCED		USED	SLUDGE PUMPED	HEAT EXCHANGER TEMPERATURE	DIGESTER TEMPERATURE
FINAL				IN ____°F	____°F
INITIAL				OUT ____°F	
TOTAL					

HOUR	D. O.	Cl_2 RES.

CHLORINE USED	
FINAL	
INITIAL	____
TOTAL	
BLOWER NO. 1	
FINAL	
INITIAL	____
TOTAL	
BLOWER NO. 2	
FINAL	
INITIAL	____
TOTAL	

SVI	
MLSS	

REMARKS: 2ND SHIFT

DESCRIPTION	QUANTITY
SCREENINGS	
GRIT	
SCUM	

AIR TEMP. ____°F

SEWAGE TEMP. ____°F

CHECKLIST			
AIR COMP.		SPRAY PUMPS	
BLOWERS		GAS COMP.	
GAS LINES		HEAT EXCH.	

WEATHER:

OPERATOR:

DATE:

- Manufacturer's equipment data (name plate data),
- Spare parts and material required to maintain the equipment,
- Inspection and lubrication records,
- Preventive maintenance records, and
- Repair records.

In addition to maintenance information, the record system should include financial data to permit cost reporting information, including:

- Date of acquisition,
- Cost,
- Maintenance and repair cost,
- Labor hours, and
- Useful life.

The method of monitoring equipment record information depends on the size and complexity of the facility, the availability of data processing support, and the types of management reports to be generated from the data. Exhibit 8 illustrates a relatively simple card file system that contains the basic data requirements.

The most common problem with the asset management element of a maintenance program is it is installed but not maintained. It is critical that the equipment records be kept completely and routinely up to date. This requires the commitment of staff, generally the chief mechanic or a record clerk, to record maintenance data as maintenance tasks are completed, and periodic reviews by the utility manager to insure that records are kept up to date.

2. Inventory and Control

A spare parts inventory and control system is essential to:

- Assure the availability of necessary spare parts and materials for both preventive and corrective maintenance,
- Maintain optimum quantity levels,
- Monitor quality, and
- Minimize the cost of carrying excess parts.

The items that need to be inventoried and the quantities to be maintained depend on the type and diversity of equipment, the availability of local vendors, lead time for delivery, frequency of use, and costs. The inventory and control system includes the following elements:

- Identification of all inventory items required,

EXHIBIT 8

EQUIPMENT | INVENTORY NO. | CARD NO.

REFERENCE

MANUFACTURER | SALES & SERVICE

DATE OF MANUF: | DATE PUT INTO SERVICE: | DATE REPLACED: | LENGTH OF SERVICE

NAMEPLATE DATA– MODEL | SERIAL NO. | SIZE | RPM | TYPE

MOTOR DATA– MODEL | SERIAL NO. | FRAME | TYPE | CODE LETTER

H.P. | VOLTS | AMPS | RPM | HERTZ | PHASE | RATING | NEMA DESIGN

INSULATION CLASS | SERVICE FACTOR

REMARKS

SPARE PARTS

PARTS DESCRIPTION	UNITS RECOMMENDED	INVENTORY RECORD (NO. IN STOCK & DATE)									

SIDE 2

DATE | DESCRIPTION OF REPAIR

PARTS REPAIRED OR REPLACED	COST	BY WHOM	MANHOURS	COST	REMARKS
TOTAL COST / PARTS TOTAL		LABOR TOTAL			DOWNTIME

DATE | DESCRIPTION OF REPAIR

PARTS REPAIRED OR REPLACED	COST	BY WHOM	MANHOURS	COST	REMARKS
TOTAL COST / PARTS TOTAL		LABOR TOTAL			DOWNTIME

DATE | DESCRIPTION OF REPAIR

PARTS REPAIRED OR REPLACED	COST	BY WHOM	MANHOURS	COST	REMARKS
TOTAL COST / PARTS TOTAL		LABOR TOTAL			DOWNTIME

DATE | DESCRIPTION OF REPAIR

PARTS REPAIRED OR REPLACED	COST	BY WHOM	MANHOURS	COST	
TOTAL COST / PARTS TOTAL		LABOR TOTAL			DOWNTIME

DATE | DESCRIPTION OF REPAIR

PREVENTIVE MAINTENANCE RECORD

EXHIBIT 8 (CONT.)

CODE	TYPE OF MAINTENANCE PERFORMED	CODE	TYPE OF MAINTENANCE PERFORMED	CODE	TYPE OF MAINTENANCE PERFORMED

DATE	CODE	BY WHOM	REMARKS	DATE	CODE	BY WHOM	REMARKS	DATE	CODE	BY WHOM	REMARKS

- o Classification of items, and
- o Control system.

The identification of inventory items should be based on the equipment record system discussed previously, the maintenance manual, equipment service manuals, and maintenance staff experience.

Items should be classified based on factors such things as cost, usage, delivery time, shelf life and impact on plant operations. Using this classification, quantities and reorder policies should be established. Where financial and/or management resources are limited, reorder policies should be developed to ensure an adequate supply of the most critical spare parts.

The inventory control system should include the following information:

- o Item identification,
- o Units of measure,
- o Purchasing lead time,
- o Stock requirements,
- o Reorder points,
- o Quantities on hand, and
- o Cost.

See Exhibit 9 for a sample inventory card.

3. Records and Monitoring System

The basis for reporting and monitoring the maintenance program is the "work order" system. It should be used to initiate all preventive and corrective maintenance activities where parts are required, equipment is out of service, or a certain level of labor is required. Routine maintenance tasks below certain time requirements need not be placed on work orders but should be entered into the maintenance log and equipment record system.

Exhibit 10 is an example of a typical work order. After work is completed, work order information should be transferred to the permanent equipment record system, the inventory control system, and the management information systems recording labor distribution and cost data. Work orders should be filed chronologically and by equipment item for future reference.

EXHIBIT 9

INVENTORY RECORD CARD

*Commodity Class Code: ____ Minimum Stock Qty: ____ Maximum Stock Qty: ____
Description: Required Lead Time: ____ Unit of Measure: ____
Primary Vendor: ____ Storage Location: ____

ORDERED				RECEIVED			ISSUED				BALANCE		
Date	P.O. No.	Vendor	Qty.	Date	Qty.	Amt.($)	Date	Equip.	Qty.	$ Amt.	Date	Qty.	Amt.

Additional considerations:
1. Seasonal Maintenance Requirements Date ____ Quantity ____
2. New Equipment Purchase Date ____ Quantity ____
3. Other:

* See Exhibit 17 for examples of Commodity Class Codes

EXHIBIT 10

SEWER
WATER
METER
ELECTRIC PROD.

MAINTENANCE DIVISION WORK ORDER

☐ GENERAL OFFICE
☐ STORES

ISSUED	DATE COMPLETED	LOCATION

TO BE PERFORMED

ACTUALLY PERFORMED

UNIT	MATERIALS FROM STOCK	UNIT	MATERIALS FROM STOCK

EMPLOYEE NAME	HOURS	EMPLOYEE NAME	HOURS

TRUCK NUMBER	HOURS	TRUCK NUMBER	HOURS	TRUCK NUMBER	HOURS	TRUCK NUMBER	HOURS

WORK COMPLETED FOREMAN DATE

COMPLETION CHECK SUPT DATE

Additional guidance in development maintenance management systems can be found in -

- "A Planned Maintenance Management System for Municipal Wastewater Treatment Plants," EPA-600/2-73-004.

C. Energy Management

Since the energy crises in the mid 1970's energy availability and high energy costs have become a major concern to most wastewater utility managers. A critical element of efficient plant management is a program to plan, monitor and control energy usage and cost without sacrificing facility operations. To accomplish this, utility managers should develop and implement a comprehensive energy management program.

1. Identification and Monitoring of Energy Usage

To develop an effective energy management program, the utility manager must have a good understanding of energy usage in his operation, have developed sufficient baseline data, and have reviewed operating and maintenance procedures to determine the impact on energy management alternatives. Also, he must thoroughly understand the billing system that is being used to assess energy user charges.

a. Baseline Energy and Cost Data

Baseline data regarding energy consumption, cost, operating procedures and design conditions should be developed. The types of data that should be gathered include:

- o Energy consumption and cost data for one or more previous years, including electric utility billing records, internal electric metering records, and records of purchased fuels. Energy consumption should be determined by unit process. Exhibit 11 illustrates a basic data collection form used for summarizing consumption and cost data. From the available data, energy consumption profiles can be established. They can be developed directly from metering records or estimates using equipment ratings multiplied by overall average running times and load factors. A typical energy profile is shown on Exhibit 12. Daily operating logs should be compared to utility bills to determine the relationship between the

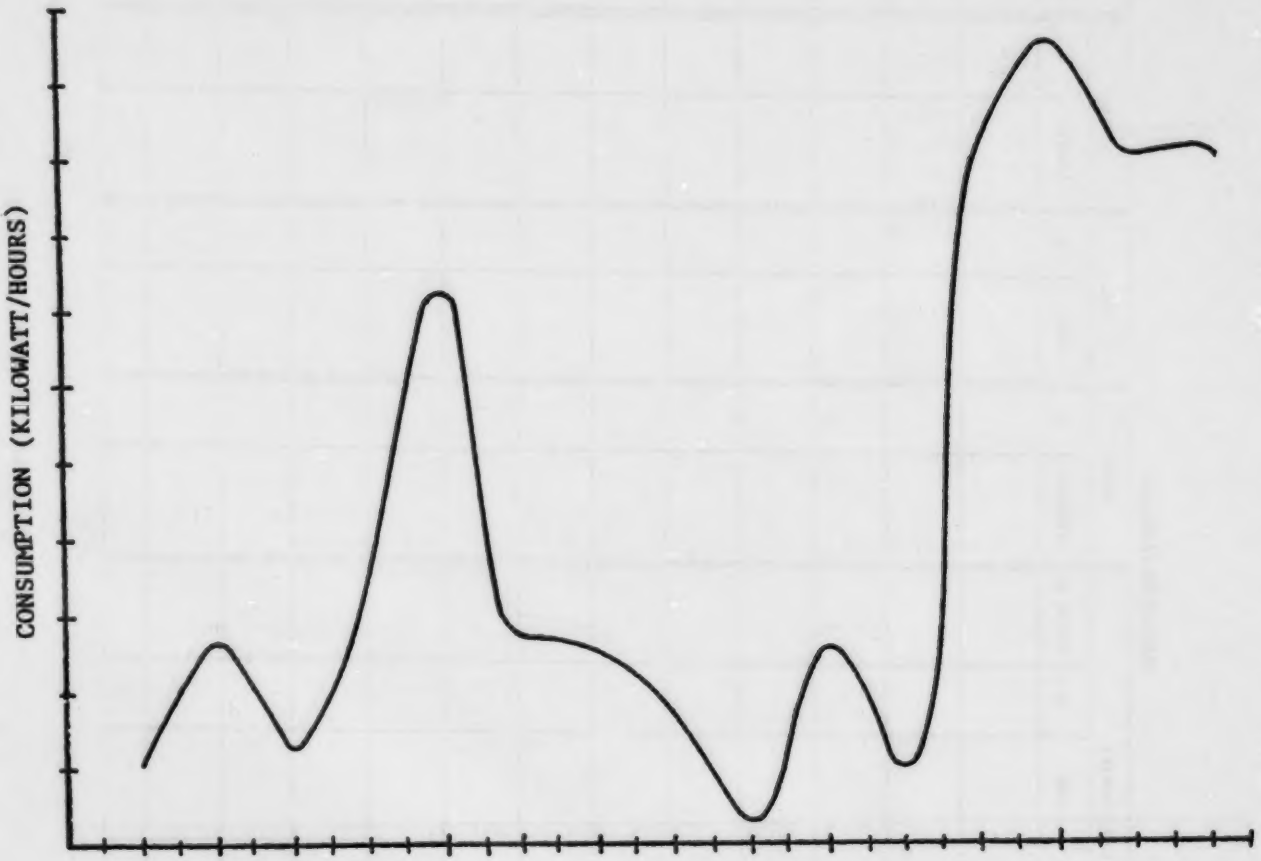
EXHIBIT 11

ENERGY DATA FORM

YEAR: _____	ELECTRICITY					GAS		OIL		OTHER		TOTAL
BILLING PERIOD or Unit Process	KWH	$	KW	$	TOTAL $	THERMS	$	GAL.	$	UNITS	$	TOTAL $
TOTAL												

EXHIBIT 12

TYPICAL ENERGY USE PROFILE



facility's energy usage and peak demand in the operation of various unit processes. Based on the energy use data, energy conservation options can be identified and evaluated. 1/

D. Sludge Management

Sludge management is an especially difficult part of utility management. Sludge management requires planning, particularly long range planning, a consistent shortcoming. Alternatives tend to be both politically and technically difficult to implement; therefore, decisions on long range solutions tend to be deferred.

1. Monitoring

Monitoring and surveillance, particularly at sludge disposal sites are essential parts of a sludge management program. The program should be developed not only to prevent potential health hazards but also to assure proper system operations. Monitoring should be initiated prior to disposal and background levels (particularly for heavy metals) clearly defined so that any changes in contaminant levels can be identified and assessed.

Specific examples of data and recordkeeping are not given here because monitoring requirements and practices will vary depending on the exact process, the size of the plant and the needs of the local facility. Estimated unit process sampling and testing needs can be found in the following guidance.

- "Sludge Handling and Conditioning," EPA 430/9-78-002

- "Estimating Laboratory Needs For Municipal Wastewater Treatment Facilities," EPA 430/9-74-002

1/ For more detailed information on energy use data, see "Energy Management Diagnostics," Office of Water Program Operations, Environmental Protection Agency, Washington, D.C. 1982.

III. Support Services Management

Some management support functions such as purchasing and personnel are often controlled external to the utility. These two functions generally represent a large portion of utility expenditures. This chapter addresses several support services functions including: purchase orders, scheduling, warehousing and spare parts, performance evaluations, labor relations and safety.

A. Purchasing

The purchasing activity supports buying the right material at the best price in the proper quantity, at the proper time and from the best supplier. Although the wastewater utility manager is usually not responsible for all purchasing activities, he must frequently:

- Provide requisitions for purchasing through a central purchasing agent; and
- Maintain separate records for purchased goods, vendor suppliers and goods received.

This section describes the types of forms and records which should be maintained.

1. Purchase Order

The purchase order is a key document in an effective purchasing system. The purchase order should be used to control the item count (number of goods) and cost of goods received. At a minimum, the purchase order form should:

- Provide adequate space for vendor and utility name, vendor and utility address, vendor contact and vendor phone number;
- Permit entry of all items or commodities ordered with space for:
  - Commodity (stock item) number or code,
  - Description and quantity ordered,
  - Unit price and payment terms,
  - Total anticipated price,
  - Scheduled delivery date, and
  - Shipping terms;
- Trace the vendor quotes received;
- Identify vendor selection process;
- Provide for authorizations and signatures;
- Indicate purchase order copy distribution; and
- Contain a prenumbered reference for control purposes.

a. Format

Exhibit 13 illustrates a purchase order designed to support the recommended policies and processing for a utility purchasing system. This format permits the purchase order to serve as the:

- Request for vendor delivery,
- Price agreement,
- Vendor tracking system,
- Accounting approval for payment, and
- Payment voucher.

b. Limited Purchase Order

A limited purchase order is an authorization to commit a relatively small expenditure with an approved vendor. Exhibit 14 illustrates a typical limited purchase order.

c. Purchase Order Origination

The utility manager should initiate purchase orders supporting utility purchases. Because of:

- Centralized control of purchase order numbers,
- Centralized collection and maintenance of records,
  - Vendor list,
  - Inventory cards,
  - Purchase order files,
  - Receiving schedules,
  - Specification documents,
  - Parts lists,

- On site availability of records to support maintenance activities in the facility, and

- Reduced clerical burden and duplication of work in administrative offices.

Exhibit 15 illustrates a format for recording request for quotations. Exhibit 16 illustrates a vendor listing and Exhibit 17 illustrates a checklist for evaluating vendors.

EXHIBIT 13

PURCHASE ORDER

To: Vendor Name Address Attn: _____ Phone_____	From: Utility Name Address Attn:_____ Phone_____	P.O. # _____ Order date / / Requested Delivery Date / /

Comm. No.	Description	Quanity	Unit Price	Total Price	Account No.

AWARD & CONTROL DATA

TYPE OF QUOTE Verbal	Written		Sealed Bid	Selection
Vendor	No.	Unit Price	Description	1 2 3
Verbal Quotes Only				Reason:
1.				
2.				
3.				

Written and Sealed Bid Quotes Only

Completed RFQ Attached Yes No Reason: _____
Purchase posted to fixed Asset Records Yes No Reason: _____
Materials and spare parts list Obtained Yes No Reason: _____

Prepared by _____ Date _____ Approved By _____ Date _____
Title _____
Approved for Payment _____ Date _____ Paid Date _____ Check No. _____

DISTRIBUTION: White: Vendor Pink: Utility Blue: Accounting Yellow: MIS

EXHIBIT 14

LIMITED PURCHASE ORDER

Vendor Name Address Attn: _____ Phone_____ No._____	Utility Name Address Attn:_____ Phone_____	LPO # _____

Quantity	Description	Comm. No	Unit Price	Total Price
1.				
2.				
3.				
	Total (less than $100.00)			$_____

Justification	
1.	Account No:
2.	Account No:
3.	Account No:

Authorized By _____ Date _____

Paid By _____ Date _____ Check No._____

DISTRIBUTION: White: Vendor Pink: Utility Blue: Accounting

EXHIBIT 15

REQUEST FOR QUOTATION

THIS IS NOT AN ORDER

TO:	FROM:	P.O. Reference No._____
Vendor Name Address Attn: Phone:	Utility Name Address Attn: Phone:	

Dear Vendor,

Please provide a unit price quotation for the goods and/or services described below. Keep the attached duplicate copy and return the original to the above address. Explain any substitutes or modifications to the description completely. YOUR QUOTATION MUST BE IN OUR OFFICE AT THE ABOVE ADDRESS BY: (a.m./p.m.) 19

Delivery to be made from_____in ____days from receipt of order.

Terms:_____estimated shipping weight_____lbs.

ITEM	QUAN.	DESCRIPTION OF GOODS AND/OR SERVICES	UNIT PRICE

We quote you as noted above:

Signed: Title: Date:

VENDOR LIST

Revised _____

For Quotation Reference
P.O. Number: _____
Date submitted: _____

Vendor RFQ	Vendor Name	Vendor Number	Address	Contact Person	Phone	Commodities

EXHIBIT 16

EXHIBIT 17

VENDOR EVALUATION CHECKLIST

Criteria	Vendor A:_____ Rating	Vendor B:_____ Rating	Vendor C:_____ Rating
1. Lowest Price	low medium high	low medium high	low medium high
2. Delivery Date	first second third	first second third	first second third
3. Post Performance	low average high	low average high	low average high
4. Freight/Delivery	low medium high	low medium high	low medium high
5. Discount Offered	low medium high	low medium high	low medium high
6. Multi-Commodity	low medium high	low medium high	low medium high
7. Type of Commodity	brand name replace-ment tooled	brand name replace-ment tooled	brand name replace-ment tooled
8. Price Adjustment Clause	yes no	yes no	yes no
9. Variation to Specifications	none slight substan-tial	none slight substan-tial	none slight sub-stantial
10. Non-Collusion Clause	yes no	yes no	yes no

2. Scheduling

Planning and scheduling purchases over a given period of time enhances:

- o Cost efficiency,
- o Cash flow planning,
- o Budgeting capabilities, and
- o Timely maintenance activities.

To accomplish this the utility manager should collect 2 - 3 years of expenditure data showing:

- o Type of purchase,
- o Amount,
- o Date, and
- o Stock or immediate use item.

The manager then records this data on a purchase schedule as illustrated in Exhibit 18. Using current year budget data and capital and operating plans for the facility the manager can then project current year purchase requirements by month.

3. Inventory Management

Timely equipment repair is critical to the reliable operation of a wastewater utility. This function depends upon an adequate spare parts inventory. The utility manager's inventory should contain a proper mix and quantity of items.

a. Classification of Inventory

To assist the manager in assessing inventory items on hand, a proper inventory classification should be established. The following commodity classes represent the goods purchased by a utility:

Commodity Class Code	Commodity Description
100	Office Supplies
200	Chemicals
300	Maintenance Supplies
400	Laboratory Supplies
500	Equipment Parts
600	Training Supplies
700	Tools

UTILITY PURCHASE SCHEDULE

Commodity Class	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June
100 Office Supplies												
Year 1												
2												
3												
200 Janitorial Supplies												
Year 1												
2												
3												
300 Operating Supplies												
Year 1												
2												
3												
400 Chemicals												
Year 1												
2												
3												
500 Maintenance Supplies												
Total Purchases												
Year 1												
2												
3												

EXHIBIT 18

Each class should be subdivided to provide a level of detail appropriate to the utility. For example:

600 Training Supplies

10 Operations and Maintenance Manuals
20 Publications
30 Textbooks
40 Films
50 Packaged course materials

Class 500, equipment parts, should be organized by type of equipment to compliment the equipment record card (see Exhibit 8). Each equipment record card should include a recommended spare parts inventory. Warehousing is responsible for assembling the parts required by equipment group and identifying interchangeable parts and parts substitutions. This may require the assistance of a mechanic.

b. Inventory Control and Order Points

Utility management includes the control of inventory and identification of order points. To manage the function properly, a system of perpetual inventory cards should be maintained. Exhibit 8 is an example of an inventory record card. This card does not replace an equipment record card, but does indicate which spare parts are required to repair a specific piece of equipment. The inventory card provides data regarding on hand quantity and required quantity for parts to repair all equipment using that part. Minimum stock quantity may be determined by:

- Dividing total number of parts or units used per year by the total number of operating days in the year; the result is the average quantity used per day.

- Multiplying the average quantity used per day times the number of days required from the point of order request to the point of delivery; the product is the required number of parts or units needed during that order period.

- Multiply the above product times 1.25 for a 25% safety margin (this margin may be increased or decreased depending on the item purchase).

The maximum stock quantity indicates the inventory level over which the cost of storing the inventory is excessive and may not be justified.

B. Personnel

Personnel management affects all levels and departments of an organization. This function, if not properly managed, can have a far reaching negative impact on the utility. Personnel management requires maintenance of personnel records. These records should provide a complete history of each staff member from hiring to termination and should include:

- The application form,
- Job descriptions,
- Interview notes,
- Insurance and tax forms,
- Performance evaluations,
- Salary history,
- Sick leave and vacation history,
- Training, and
- Notes from an exit interview given at employment termination. 1/

1. Performance Evaluation

The performance of each employee should be reviewed at least annually. This annual review process involves utility management in the employee's career objectives and encourages a commitment to effective and efficient utility operations consistent with the utility's overall objective. The review should be objective, open, and the results should be documented. Exhibit 19 is a sample annual evaluation form which serves as a minimum benchmark for discussion. Since this form is subjective, it should be supplemented with notes on the employees performance of tasks and other initiatives and accomplishments.

1/ For detailed information on staffing needs, see "Estimated Staffing for Municipal Wastewater Treatment Facilities," Office of Water Program Operations, Environmental Protection Agency, Washington, D.C. March, 1973.

EMPLOYEE PERFORMANCE REVIEW AND EVALUATION

Name_____ Date_____

Department_____ Job Classification_____ Grade_____

Duties

DO NOT ALLOW PERSONAL FEELING TO GOVERN YOUR RATING. Do not be influenced by UNUSUAL SITUATIONS which are not typical. Check in block which seems best to fit above employee.

Knowledge of Work	Practically None ☐	☐	Below Average ☐	☐	Acceptable Knowledge ☐	☐	Somewhat above Average ☐	☐	Very well informed ☐
Effect on Workers	Often Breeds Trouble ☐	☐	Sometimes causes Dissension ☐	☐	No outstanding effect on workers ☐	☐	Better than Average ☐	☐	Promotes cooperation and Goodwill ☐
Promptness	Always Tardy ☐	☐	Must be reminded about Promptness ☐	☐	Usually Prompt ☐	☐	Never Late without good cause ☐	☐	Almost never Late ☐
Responsibility	Careless and Negligent ☐	☐	Not very reliable ☐	☐	Accepts Resp. when asked ☐	☐	Assumes Resp. without being told ☐	☐	Accepts Resp. above Average Requirement ☐
Accuracy	Is highly inaccurate ☐	☐	Is often inaccurate ☐	☐	Makes Occasional errors ☐	☐	Somewhat above Average ☐	☐	Rarely makes mistakes ☐
Quantity of Work	Amount of work unsatisfactory ☐	☐	Turns out just enough to get by ☐	☐	Turns out fair amt. ☐	☐	Always finishes alloted amount ☐	☐	Turns out more than average amount ☐
Initiative	Must always be told what to do ☐	☐	Needs considerable Supervision ☐	☐	Needs Direction and help in cases ☐	☐	Needs little Supervision ☐	☐	Pushes work thru on own initiative ☐
Application	Indifferent and Lazy ☐	☐	Tendancy toward Indifference ☐	☐	Average application ☐	☐	Interested and Diligent ☐	☐	Puts extra effort into work ☐

Comments:

Use back of sheet for additional information or remarks.

2. Safety

Every utility should have a formally recognized safety program. A good program will accomplish three goals:

- o Reduce the total cost of operations;
- o Increase productivity; and
- o Provide a feeling of security and well-being for personnel.

A successful safety program starts with management's. commitment of necessary time and resources.

a. Accidents

After a new employee has been hired, the manager must ensure that he is given the proper training in the work skill for the job and in the safety program. This will greatly reduce the chance of accidents. If an accident occurs, the immediate supervisor and safety officer should be informed. The supervisor should investigate each accident thoroughly and complete an accident report similar to the one shown on Exhibit 20. Should an employee need medical attention, he should be taken to a specified doctor, clinic or hospital. The accident report should show the doctor's name and diagnosis, the cause of the accident, and what has been done to prevent it from happening again. The information on these forms can be used to prepare a monthly summary of all accidents. A form such as the one shown on Exhibit 21 can be used. These reports can be reviewed to find ways of decreasing accidents.

EXHIBIT 20

No._____

SUPERVISOR'S ACCIDENT REPORT

Name of Injured_____ Date of Injury_____ Time____ A.M. P.M.

Department_____ Division_____

Location_____ Occupation_____

Doctor_____ Hospital_____ Estimated Lost Time_____

Describe the Injury_____

_____

_____

Describe fully how accident happened, and what employee was doing when injured:

_____

_____

_____

_____

_____

CAUSES OF ACCIDENT

Unsafe Equipment_____ Unsafe Conditions_____ Unsafe Act_____

Explain the above:_____

_____

What has been done to prevent a recurrence of this type of accident?_____

_____

Witnesses:_____

_____

Reported by:_____

Approved by Dept. Head_____

Approved by Manager_____

Supervisor's accident report form.

MONTHLY ACCIDENT SUMMARY

Department & Divisions	THIS MONTH						CUMULATIVE THIS YEAR					
	Man Hrs Worked	Minor Acc.	L.T. Acc.	Days Lost	Fre-quency	Sever-ity	Man Hrs Worked	Minor Acc.	L.T. Acc.	Days Lost	Fre-quency	Sever-ity
TOTALS												

Monthly accident summary form.

IV. Finance and Accounting

Accounting in publicly owned treatment works (POTWs) is important for two significant reasons. First, accounting can provide local officials with a high level of confidence that resources are being used properly. Secondly, accounting reports can provide local officials with the information they need to evaluate utility performance and set a course for future action.1/ Complete and timely accounting reports are vital ingredients in successful management and policy making. These reports should cover such matters as local financial conditions, actual performance against budgeted expenditure and revenue targets, or the cost of providing specific types of service. Through sound accounting procedures and periodic audits of financial records and procedures, assurance is gained that the resources of the utility are properly safeguarded. The purpose of this chapter is to set forth some basic accounting procedures and practices, and to show the utility manager how he can (through operating statements) match actual results of operations with planned or budgeted amounts.

A. Internal Controls

To implement and maintain a sound accounting process successfully, accounting functions should be well organized and controlled. Accounting responsibilities, procedures and policies should be designed to help prevent:

- Misstatement of account balances because of errors (both intentional and unintentional) and,
- Misappropriation of cash and other resources of the utility.

These objectives are attained through a system of internal controls which is established and followed by accounting personnel. Some of the specific characteristics of a system of internal controls are described below.

1. Separate Accounting Duties

Whenever possible, accounting procedures should be devised so that no single person handles a particular transaction from beginning to end. Under this approach one person can check the work of the other.

1/ For detailed information on utility planning and budgeting, see "Comprehensive Diagnostic Evaluation and Selected Utility Management Issues", Office of Water Program Operations, EPA, Washington, D.C. 1982.

2. Use and Control Prenumbered Forms

All forms used in the accounting process should have preassigned numbers in a specific sequence. The forms can then be accounted for during the day-to-day accounting routine. Voided forms should be properly cancelled so their whereabouts are known. This prenumbered form control procedure helps assure that accounting transactions are properly recorded in the accounting system.

3. Approval Signature

A responsible official should sign off on certain accounting transactions including:

- o Issuing of purchase orders;
- o Approving of invoices and payrolls for payment;
- o Signing checks;
- o Depositing cash; and
- o Recording journal entries

This approval process fixes final responsibility for these accounting transactions.

4. Reconcile Subsidiary Records to Control Totals

Totals of subsidiary records should be reconciled to control totals regularly. Differences must be checked out and resolved. Key functional areas include cash, accounts receivable, and accounts payable.

B. Chart of Accounts

The chart of accounts provides the means by which all accounting transactions are classified and recorded. The chart of accounts also provides the framework within which information in accounting records is extracted, summarized and reported. Accordingly the chart of accounts should allow the classification of information in a way which:

- o Facilitates control of utility assets and liabilities; and
- o Is useful to those who receive financial reports including internal management, elected officials, investors, and the public.

To accomplish these objectives, information should be classified in the same format and level of detail in the chart of accounts as in the budget.

1. Elements

a. Fund: An independent fiscal and accounting entity with a self-balancing set of accounts recording cash and/or other resources together with all related liabilities, obligations, reserves, and equities which are separated for the purpose of carrying on specific activities or attaining certain objectives.

b. Type of Account: (Asset, liability, revenue, expenditure).

c. Organization: The department and any departmental subdivisions responsible for a particular expenditure.

d. Activities: The specific services or administrative functions performed.

e. Objects of Expenditure: The specific category of cost designed to provide detail on the types of commodities or services purchased by utilities.

f. Source of Revenue: The type of revenue received.

g. Program or Project: A special classification which can be used to identify major capital outlay or Federal projects.

2. Coding

A set of codes must be established to identify each element in the chart of accounts. The number of elements included in each classification will depend on the reporting needs of the utility. See Exhibit 22 for possible coding. The coding scheme for the chart of accounts should provide codes for all elements currently in the structure and make provision for adding new elements or adjusting existing elements. See Exhibit 23 for a simplified chart of accounts.

C. Accounting Records

Every financial transaction of the municipality should be recorded in the accounting records.

These records consist of:

- Source documents,
- Books of original entry, and
- Books of final entry.

EXHIBIT 22

SAMPLE ACCOUNT CODING STRUCTURE

FUND		ORGANIZATION		ACTIVITY*		MAJOR OBJECTS		REVENUE SOURCES	
10	General	10	General Government	100	Collection	100	Personal Services	10	Taxes
20	Special Revenue	20	Police	200	Pumping	200	Operating Expenses	11	General Property
30	Capital Projects	30	Public Works	300	Treatment	300	Maintenance Expense	20	User Charges
40	Enterprise	31	Wastewater Utility	310	Preliminary	400	Capital Outlay	21	Sewer User Charges
41	Wastewater Enterprise	40	Fire	320	Primary			30	Intergovernmental
50	Internal Service	50	Library	330	Secondary			40	License Permits
60	Special Assessment	60	Health	340	Tertiary			50	Departmental Billings
70	Debt Service	70	Parks	350	Sludge			60	Rent
80	Trust and Agency			400	General			70	Miscellaneous
				500	Laboratory				

*Wastewater Only

EXHIBIT 23

SAMPLE UTILITY CHART OF ACCOUNTS
WASTEWATER TREATMENT

BALANCE SHEET ACCOUNTS	ACTIVITY	REVENUE ACCOUNTS	EXPENSE ACCOUNTS
Assets	Collection	General Property Tax	Personal Services
Cash	Pump Stations	User Charges	Operating
Accounts Receivable	Treatment	Septage Disposal	Maintenance
Due from other Funds	Laboratory	Interest on Investments	Capital Outlay
Prepaid Expenses	General	Rent	
Materials and Supplies		Sale of Equipment	
Restricted Assets		Intergovernmental	
Equipment		Department Billings	
Utility Plant		Sewer Availability Charges	
Construction in Progress		Connection Fees	
		Development Fees	
Liabilities		Special Assessments	
Accounts Payable			
Due to other Funds			
Notes Payable			
Bonds Payable			
Customer Deposits			
Accrued Liabilities			
Fund Equity			
Contributions			
Retained Earnings			
Reserves			

1. Source Document

The details of financial and other transactions are usually described on documents from parties outside the utility and prepared within. A purchase of goods or services, for example, may involve:

- o Internal documents; and
  - Purchase requisition,
  - Purchase order,
  - Receiving report, and
  - Check
- o External documents.
  - Vendor packing slip/shipping documents; and,
  - Vendor invoices.

These source documents should provide the details of the transaction. The accounting information is recorded in one of the books of original entry and the source documents are then filed. Examples of source documents are deposit slips, receipts for cash received, utility bills, notes payable and payroll checks.

2. Books of Original Entry

Books of original entry are internal accounting registers or journals in which accounting information is recorded from the source documents. Book of original entry include:

- o Cash Receipts Journal. Cash received by the utility is recorded in this journal,
- o Cash Disbursement Journal. Payments made by the utility are recorded in this journal.
- o Payroll Journal. Payroll checks issued are recorded here.
- o Purchase Journal. Purchase orders issued are recorded in this journal.
- o Revenue Journal. Bills issued are recorded in the revenue journal. and,
- o General Journal. Journal entries are recorded here.

3. Books of Final Entry

Books of final entry are the principal accounting records from which financial and management reports are prepared. These books should classify information in the same manner as the budget and chart of accounts. The information in these books is posted from the books of original entry. The principal books of final entry are:

- o General Ledger. The general ledger is a comprehensive record of the financial activity of the utility. It contains the current balance (deficits and credits) for each general ledger account in the chart of accounts;

- o Operating Ledgers. These ledgers maintain detailed accounting for revenues, appropriations, operating budgets, encumbrances and expenditures. These are used primarily in the larger utilities. Specific ledgers might include;

  - Revenue Ledger, and
  - Budget and Expenditures Ledger.

- o Payable Ledgers. These contain balances for individuals or businesses the utility owes money. They form subsidiaries to various liability accounts; and

Ledgers	Liability Account
Account Payable Ledger	Accounts Payable
Bond Payable Ledger	Bonds Outstanding

- o Receivable Ledgers. These record amounts for each individual or business that owes the utility money.

Ledgers	Control Account
Accounts Receivable Ledger	Accounts Receivable
Special Levies Ledger	Special Levies Due

D. Interim Financial Reports

Interim financial reports are prepared primarily for internal use by management and the governing body in the process of planning and control. These interim reports must be complete, accurate, clear and timely. Basic interim reports are:

- o The Balance Sheet (see Exhibit 24);

SAMPLE BALANCE SHEET

ASSETS

Cash
Investments
Accounts Receivable
Due from other Funds
Prepaid Expenses
Materials and Supplies
Restricted Assets
Equipment
  less Accumulated Depreciation
Utility Plant
  less Accumulated Depreciation
Contruction in Progress

TOTAL ASSETS

LIABILITIES AND FUND EQUITY

Liabilities
  Accounts Payable
  Due to Other Funds
  Notes Payable
  Bonds Payable
  Customer Deposits
  Accrued Liabilities

  Total Liabilities

Fund Equity
  Contributions
  Retained Earnings
  Reserves
    Total Fund Equity

TOTAL LIABILITIES AND FUND EQUITY

EXHIBIT 24

BALANCE SHEET

Use	Description	Key Data Elements	Data Element Source
Utility manager, municipal officials and third parties use this report to understand the financial position of the utility at a specific point in time, typically at the end of a fiscal year. This report, in conjunction with the statement of revenues, expenses and changes in retained earnings and the statement of changes in financed position are used by bankers and investors for bonding and investment decisions.	The Balance Sheet(Statement of Financial Position) is one of three major financial reports. It reports the balance of all general ledger asset, liability and fund equity accounts. Net income for the year is normally added to retained earnings (losses are subtracted). Annual depreciation is added to the accumulated depreciation by asset catogory (Equipment and plant).	1. Asset Accounts 2. Liability Accounts 3. Fund Equity Accounts	1. General Ledger 2. Fixed Asset Records 3. Net Income or Loss

- The Statement of Actual and Estimated Revenues (see Exhibit 25);
- Summary Statement of Actual and Budgeted Expenditures and Encumbrances (see Exhibit 26);
- Statement of Actual and Budgeted Expenditures and Encumbrances, by Department/Activity (see Exhibit 27);
- Cash Flow Results and Forecast (see Exhibit 28);
- The Statement of Revenues, Expenses and Changes in Retained Earnings (see Exhibit 29); and
- The Statement of Changes in Financial Position (see Exhibit 30).

1. The Balance Sheet

The Balance Sheet shows the financial position of the utility at a particular date, usually month end or year end. It reports the assets, liabilities, reserves and fund balances.

2. Statement of Actual and Estimated Revenues

The Statement of Actual and Estimated Revenues is an analysis of the revenues of the current month and an analysis of the cumulative revenues to the date of the report. It also indicates the balance yet to be received to meet the annual estimate. The comparison of the actual revenues with the estimate is important to the planning of future budget estimates. It shows the accuracy of revenue estimates and provides an early indication of cases where revenue may exceed or fall short of expectations. This information allows officials to alter their planned courses of action accordingly.

3. Statement of Actual and Budgeted Expenditures and Encumbrances

This statement is used to control expenditures and allows:

- Comparison of expenditures for the month with the budget for the month;
- Comparison of year-to-date expenditures to the budget;

STATEMENT OF ACTUAL AND ESTIMATED REVENUES
WASTEWATER TREATMENT

Revenue Sources	Current Month Estimated	Current Month Actual	Current Month Over (Under)	Year To Date Total Estimated	Year To Date Estimated	Year To Date Actual	Year To Date Over (Under)	Year To Date Balance to Be Collected
User Charges								
General Property Taxes								
Federal Grants								
State Grants								
Septic Tank Disposal Fees								
Interest Revenue								
Rents								
Sewer Availability Charges								
Connection Fees								
Development Fees								
Special Assessments								
Other								
Total Revenue								

EXHIBIT 25

STATEMENT OF ACTUAL AND ESTIMATED REVENUES

Use	Description	Key Data Elements	Data Element Source
Utility manager uses this report to identify by revenue account, the current month and year to date: . Estimated (budgeted) revenue . Actual receipts collected . Variances . Balances to be collected This report is important to analyze cash collected from various revenue sources.	Monthly status report of current month and year to date cash collected compared to revenue budgeted by revenue source. All revenue sources (except bonds) are recorded on this report, operating and capital revenue sources. This report does not report billings. Cash collected is reported against budgeted resources.	1. Revenue Budget 2. Cash Collected 3. Revenue Accounts	1. Cash Receipts Journal 2. Revenue Ledger 3. General Ledger 4. Operating Budget

EXHIBIT 25a

EXHIBIT 26

Summary Statement of Actual and Budgeted Expenditures and Encumbrances

For the Month of September, 19xx and Nine Months Ended September 30, 19xx

Department/ Function/ Activity	Month of September, 19xx				Jan. - Sept. 19xx					
	19xx Appropriation (Revised) (1)	Budgeted (2)	Actual (3)	Actual Under (Over) Budgeted (4)	Budgeted (5)	Actual (6)	Actual Under (Over) Budgeted (7)	Unexpected Balance (8)	Encumbrances (9)	Unemcumbered Balance (10)
Wastewater Treatment										
Operations	$	$	$	$	$	$	$	$	$	$
TOTAL										
Administration										
Operations										
Maintenance										
Engineering										
Inspections										
Customer Service										
Debt Service										
TOTAL	$	$	$	$	$	$	$	$	$	$

Statement of Actual and Budgeted Expenditures and Encumbrances, By Department/Activity

For the Month of September, 19xx and Nine Months Ended September 30, 19xx

Department/ Object	19xx Appropriation (Revised) (1)	Month of September, 19xx			Jan. - Sept. 19xx					
		Budgeted (2)	Actual (3)	Actual Under (Over) Budgeted (4)	Budgeted (5)	Actual (6)	Actual Under (Over) Budgeted (7)	Unexpected Balance (8)	Encumbrances (9)	Unencumbered Balance (10)
Department Name:										
Personal Services	$	$	$	$	$	$	$	$	$	$
Supplies										
Other Services and Charges										
Capital Outlays										
TOTAL	$	$	$	$	$	$	$	$	$	$

EXHIBIT 27

Cash Flow Results and Forecast

Results for_____and Forecast through_____

Fund	Results for (Current Month) Beginning Balance	Receipts	Disbursements	Ending Balance	Projected for (Each Projected Month) Beginning Balance	Receipts	Disbursements	Ending Balance	(Additional Projected Months) "	"	"
	$	$	$	$	$	$	$	$	$	$	$
TOTAL-ALL FUNDS	$	$	$	$	$	$	$	$	$	$	$

EXHIBIT 28

CASH FLOW RESULTS AND FORECAST

Use	Description	Key Data Elements	Data Element Source
Utility manager uses this report to monitor for the current and subsequent month(s), by fund: - Beginning and ending balance - Receipts - Disbursements	This monthly report summarizes by fund, the receipts, disbursements and beginning and ending balances. It is an important report when multiple funds are used to finance utility operations such as: - General - Special Assessment - Enterprise	1. Fund Sources 2. Receipts 3. Disbursements 4. Balances	1. Cash Receipts Journal 2. Cash Receipts Journal 3. Cash Disbursements Journal 4. General Ledger

EXHIBIT 28a

STATEMENT OF REVENUES, EXPENSES AND CHANGES IN RETAINED EARNINGS

WASTEWATER TREATMENT UTILITY

Operating Revenues
- User Charges
- Septage Disposal Fees
- Total Operating Revenues

Operating Expenses
- Personal Services
- Operations
- Maintenance
- Depreciation
- Capital Outlay
- Other
- Total Operating Expenses

Operating Income

Non-Operating Revenues (Expenses)
- Operating Grants
- Interest Revenue
- Rent
- Sewer Availability Charges
- Connection Fees
- Interest Expense
- Total Non-Operating Revenues (Expenses)

Net Income (Loss)

Retained Earnings July 1

Retained Earnings June 30

STATEMENT OF REVENUES, EXPENSES AND CHANGE IN RETAINED EARNINGS

Use	Description	Key Data Elements	Data Element Source
Utility managers, municipal officials, and third parties use this report to understand the results of operations for the period reported, usually monthly. This report, in conjuction with the Balance Sheet and Statment of Changes in Financial Position is used by bankers and investors in their decision to loan funds to the utility.	This report (also known as the income statement or profit and loss statement) describe by operating and non operating categories, the results of operations for the period. It reports revenues and expenses and the impact of net income (loss) in retained earnings. The final retained earning (June 30) is then reported on the Balance Sheet. This report is issued monthly.	1. Revenues 2. Expenses 3. Retained Earnings.	1. Cash Receipts Journal 2. Cash Disbursements Journal 3. Calculated Retained Earnings.

EXHIBIT 29a

STATEMENT OF CHANGES IN FINANCIAL POSITION

WASTEWATER TREATMENT UTILITY

Sources of Working Capital
- Operations
  - Net Income
  - Items not Requiring Working Capital
    - Depreciation
    - Working Capital Provided by Operations
- Cash from Bond Proceeds
- Contributions

Total Sources of Working Capital

Uses of Working Capital
- Aquisition of Property, Plant and Equipment
- Retirement of Bonds
- Net Decrease in other Current Liabilities
- Net Increase in other Assets

Total Use of Working Capital

Net Increase(Decrease) in Working Capital

EXHIBIT 30

STATEMENT OF CHANGES IN FINANCIAL POSITION

Use	Description	Key Data Elements	Data Elements Source
The utility manager, municipal officials and third parties use this report to understand the sources and use of utility working capital funds (current assets - current liabilities). Along with the Balance Sheet and statement of revenues, expenses, and changes in retained earnings, this report is used by bankers and investors in their decisions to loan funds to the utility.	This report describes the utility's sources and uses of funds. It provides a linkage between the Balance Sheet of one period to another and provides insights as to major utility transactions. It is produced once per year.	1. Cash 2. Disbursements 3. Working Capital 4. Net Income 5. Revenues 6. Expenses 7. Depreciation	1. Cash Disbursements Journal 2. Cash Disbursements Journal 3. Calculated 4. Income statement 5. General Ledger 6. General Ledger 7. Fixed Asset Records

EXHIBIT 30a

- o See the unexpended balance of the appropriation for a given period;

- o See the outstanding encumbrances for a given period. This can be determined by adding the unpaid purchase orders and contracts for the utility; and,

- o See the uncommitted balance of the appropriation at a given point in time

4. Statement of Actual and Budgeted Expenditures and Encumbrances by Department/Activity

This statement shows a detailed listing, by object code, of expenditures and encumbrances for each department. It is given to the department head to assist in controlling departmental expenditures.

5. Cash Flow Analysis

This statement shows the cash position at the report date and projects what it will be on certain future dates. These forecast guide utility personnel in adjusting expenditures to revenues. This statement enables the utility manager to anticipate and plan for cash flow problems and opportunities such as funding capital improvements and adjusting rates. It also allows the manager to maximize interest income through investment of idle funds.

The data for this forecast may come from several sources. The General Ledger for Cash will indicate the present balance in each fund. The estimated receipts from billings and miscellaneous revenues will come from a study of the previous year's records. Often times the budget documents predict income; however, this should be compared to actual trends. The estimated expenditures should come from schedules in the annual budget.

6. The Statement of Revenues, Expenses and Changes in Retained Earnings

This statement is often referred to as the income profit and loss statement which shows how much the enterprise earned or lost during a given period.

7. The Statement of Changes in Financial Position

This describes the source and use of utility working capital.

These seven statements reflect the essential minimum information that management must know and present. Other beneficial financial reports are:

- The Daily Cash Report. This gives the manager an up to the minute view of the cash on hand in any fund. The Daily Cash Report is a running balance of each day's receipts, disbursements, and new balance during the month. A sample format is shown on Exhibit 31. and,

- The Investment Record Card. To maximize the cash available for investment, all incoming cash must be deposited as soon as possible and must remain on deposit as long as possible. Only cash that is temporarily idle is invested. A readily available, easily understood investment record is essential to the investment program. See Exhibit 32 for a sample Investment Record Card.

The next chapter will discuss areas for considerations by the utility manager when considering the acquisition or use of computers to provide them with management information.

EXHIBIT 31

Sample Daily Cash Report

(Governmental Unit)

DAILY CASH REPORT FOR _____

DATE	RECEIPTS	CASH BALANCE	DISBURSEMENTS

EXHIBIT 32

Investment Record Card

(Governmental Unit)

Fiscal Year

Description of Investment: _____

DATE ACQUIRED	INTEREST RATE	DATE RECEIVED	SECURITY LOCATION

SECURITY I.D. NUMBER	COST	MATURITY DATE	FACE AMOUNT	PROCEEDS
TOTAL				

V. Management Information System (MIS)

Every organization needs reliable and timely information to plan, manage and control its operations. What was previously a relatively simple and low-profile "sewerage operation" has now become a complex, highly visible and capital intensive wastewater processing industry. Given the significance of this rapid transformation, the need for increased management planning and control capabilities and the related management information systems needed to support those planning and control objectives has become increasingly evident. A properly planned and implemented MIS will increase the utility managers ability to:

- o Understand and direct daily operations,
- o Control utility cost,
- o Monitor planned to actual performance,
- o Develop alternative approaches to operations, and
- o Allocate resources as they are required.

The data required to develop this information is defined in the various sections of this chapter. This data provides the source of the MIS. The elements of a MIS discussed in this chapter are:

- o MIS organizational responsibility,
- o Policies of report preparation,
- o Operational reports,
- o Financial reports,
- o Management reports, and
- o Manual versus electronic data processing.

A. MIS Organizational Responsibility

Responsibility for developing the MIS does not necessarily require the utility manager to write and prepare all the required reports. The manager should identify required information and delegate the responsibility of report preparation (as appropriate) to the best suited utility and/or municipal employee. Sections C, D and E list basic required reports.

B. Report Preparation

The reports outlined in the remainder of this section are considered necessary for effective utility management. A utility may require additional management information to address a certain function or meet requirements unique to that facility. Caution should be used when management mandates the preparation of reports or requires information, because

frequently the effort and expense required may offset the value of the information. Therefore in determining whether or not information should be provided, the utility manager should consider:

- Does the report really serve a purpose?
- What will the report tell me?
- Will new or different information be developed?
- What are the consequences if the report does not exist?
- What operation will be simplified or cost saved if the information is made available?
- Is the same information available elsewhere?
- Does the authority exist to put the information to practical use?
- How often should this information be available?
- Who would or should be concerned with this information, and why?

C. Operational Reports

- Plant Performance (See Exhibit 33),
- Maintenance Activity (See Exhibit 34), and
- Energy Cost and Consumption Report (See Exhibit 35).

D. Financial Reports

- Summary Statement of Actual and Budgeted Expenditures and Encumbrances (See Exhibit 26)
- Statement of Actual and Budgeted Expenditures and Encumbrances by Department/Activity (See Exhibit 27),
- Statement of Actual and Estimated Revenues (See Exhibit 25),
- Balance Sheet (See Exhibit 24),
- Statement of Revenues, Expenditures and Changes in Retained Earnings (See Exhibit 29),
- Statement of Changes in Financial Position (See Exhibit 30), and
- Cash Flow Results and Forecast (See Exhibit 28).

E. Management Reports

- Purchase Order Status (See Exhibit 36),
- Vendor File Activity (See Exhibit 37),
- Stock Activity (See Exhibit 38), and
- Employee Profile (See Exhibit 39).

EXHIBIT 33

PLANT PERFORMANCE REPORT

DATE	DAY OF WEEK	RAIN OR SNOW IN.	SEWAGE FLOW RATE MAX.	SEWAGE FLOW RATE MIN.	SEWAGE FLOW TOTAL	BOD RAW	BOD FINAL EFF.	TOTAL SUSPENDED SOLIDS mg/l RAW	TOTAL SUSPENDED SOLIDS mg/l FINAL EFF.	CHLORINATION LBS.	CHLORINATION RESIDUAL mg/l A.M.	CHLORINATION RESIDUAL mg/l P.M.	SETTLEABLE SOLIDS ml/l RAW	SETTLEABLE SOLIDS ml/l PRIM. EFF.	SETTLEABLE SOLIDS ml/l FINAL EFF.	PH RAW	PH FINAL EFF.	D.O. mg/l EFF.	TKN RAW	TKN FINAL EFF.	TOTAL NITROGEN RAW	TOTAL NITROGEN FINAL EFF.	TOTAL PHOS-PHORUS RAW	TOTAL PHOS-PHORUS FINAL EFF.
1																								
2																								
3																								
4																								
5																								
6																								
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27																								
28																								
29																								
30																								
31																								

WEEK	BOD mg/l RAW	BOD mg/l EFF.	FECAL COLIFORM PER 100 ml		EFFLUENT TURBITY OTHER OR SPECIAL ANALYSIS										SEPTIC WASTES											
1			AVE.		AVE.																					
2			AVE.		AVE.																					
3			AVE.		AVE.																					
4			AVE.		AVE.																					
5																										
AVE.																										

REMARKS: CHLORINE OR POWER OUTAGES, LOST TIME, ACCIDENTS, ETC.

PLANT PERFORMANCE REPORT

(Monthly)

USE	DESCRIPTION	KEY DATA ELEMENTS	DATA ELEMENT SOURCES
Utility Managers use this report to: . Summarize results of daily operating records. . Summarize results of daily laboratory analysis. . Identify variations in plant performance. . Report to regulatory agencies on compliance.	Monthly plant performance report of physical operations summarizing the analysis of key parameters used to monitor plant efficiency & compliance.	1. Rainfall 2. Sewage Flow 3. Chlorination 4. Settlable Solids 5. ph 6. Total Suspended Solids 7. Dissolved Oxygen 8. Biochemical Oxygen Demand 9. Coliform 10. Remarks	1. Rain Gage 2. Flow Meter Records 3. Operator Log & Lab Reports 4. Laboratory Reports 5. Laboratory Reports 6. Laboratory Reports 7. Laboratory Reports 8. Laboratory Reports 9. Laboratory Reports 10. Operator Logs

EXHIBIT 33a

MAINTENANCE ACTIVITY REPORT

(Weekly)

WORK ORDER NUMBER	DESCRIPTION TYPE OF ACTIVITY	REQUESTED START DATE	ACTUAL START DATE	SCHEDULED COMPLETION DATE	ACTUAL COMPLETION DATE	ESTIMATED COST	ACTUAL COST

EXHIBIT 34

MAINTENANCE ACTIVITY REPORT

(Weekly)

USE	DESCRIPTION	KEY DATA ELEMENTS	DATA ELEMENT SOURCES
Utility managers use this report to: . Identify types of maintenance activities being performed. . Identify delays in starting or completing scheduled maintenance. . Identify maintenance cost by activty and variation from cost estimates.	A weekly status report of maintenance activities. Should contain both scheduled preventive maintenance and corrective maintenance activities	1. Work order number 2. Type of activity 3. Requeated start date 4. Actual start date 5. Scheduled completion date 6. Actual completion date 7. Estimated cost 8. Actual cost	1. Work order 2. Work order or maintenance log 3. Weekly maintenance schedule 4. Work order or maintenance log 5. Maintenance schedule 6. Work order 7. Work order 8. Work order

EXHIBIT 34a

ENERGY COST AND CONSUMPTION REPORT

FACILITY OR OPERATING UNIT:	MONTH:

		ELECTRIC	GAS	OIL	OTHER	TOTAL
USAGE	USAGE (YEAR TO DATE)					
	BASE YEAR TO DATE					
	PERCENT ABOVE (BELOW) BASE YEAR					
PRICE	PRICE PER ENERGY UNIT (CURRENT MONTH)					
	BASE YEAR COST PER ENERGY UNIT					
	PERCENT ABOVE (BELOW) BASE YEAR					
COST	COST (YTD) DOLLARS					
	BASE YEAR COST (YTD)					
	PERCENT ABOVE (BELOW) BASE YEAR					
PERFORMANCE	USAGE PER 1000 GALLONS OR POUND OF BOD REMOVED, ETC.					
	BASE YEAR USAGE PER 1000 GALLONS					
	PERCENT ABOVE (BELOW) BASE YEAR					
	COST PER 1000 GALLONS OR POUND OF BOD REMOVED, ETC.					
	BASE YEAR COST PER 1000 GALLONS					
	PERCENT ABOVE (BELOW) BASE YEAR					

EXHIBIT 35

ENERGY COST AND CONSUMPTION REPORT

(Monthly)

USE	DESCRIPTION	KEY DATA ELEMENTS	DATA ELEMENT SOURCES
Utility managers use this report to: • Identify energy usage with facility. • Identify energy cost, both unit cost & total cost. • Evaluate performance indicators. • Evaluate the success of energy conservation options.	A monthly report that summarizes energy usage and cost for the facility. The report also reports on performance targets and compares them with previous years results to evaluate the success of energy conservation options.	1. Energy usage 2. Base year to day 3. Price per energy unit 4. Base year cost 5. Cost (YTD) 6. Base year cost 7. Performance indicators (usage/1000 gal; $/1000 gal)	1. Utility bills, vendor invoices, facility recording meters. 2. Previous monthly energy reports. 3. Utility bills, vendor invoices. 4. Previous energy usage reports. 5. Current & previous monthly reports. 6. Previous monthly reports. 7. Plant performance report, utility bills, vendor invoices.

EXHIBIT 35a

PURCHASE ORDER STATUS REPORT

Report #_____ For the period __-__ Issued to: _____

P. O. Number	Vendor Name	Vendor Number	Volume Ordered	Commodity Name	Commodity Case	Unit Price	Order Date	Receipt Amount	Receipt Date	Expense
1)										
1099	White Bearing	140	20	1" Bearing	604	$1.33	5/11/81	10*	5/27/81	$13.30
			30	2" Bearing	608	$1.41	5/11/81	30	5/27/81	42.30
	1099 Order Total		50					Received 40*		$55.60*
Month total	1 P.O. issued		50 units ordered		outstanding amount $68.90			40 units		$55.60
2) 1099	White Bearing	140					5/11/81			
3) 1099	White Bearing	140	20	1" Bearing	604		5/11/81			
1099	White Bearing	140	30	2" Bearing	608		5/11/81			

EXHIBIT 36

*Partial shipment/payment

PURCHASE ORDER STATUS REPORT

(Prepared Monthly)

Report Use	Description	Key Data Elements	Data Element Source
Facility Manager uses this report to: Identify and expedite overdue orders Identify orders which should be blanket or stock item orders Identify rapidly increasing unit prices for - possible vendor switch - possible replacement part buying - possible bulk or joint buying Identify chronic late delivery orders & vendors Provide data for next month or years purchasing planning	Monthly status report of open, received unremitted and prior month remittances for ordered items. Report is in three parts. 1. Sequential list of open and prior month paid, P.O.'s by P.O. number. All other data is represented 2. Alphabetical list of vendors with vendor number and index reference to applicable open P.O.'s. 3. Sequential list of commodities by commodity number with index reference to open P.O.'s. Note: Reports 2 & 3 are designed for Electronic Data Processing Systems. Index filing of P.O. copies will provide the information in a manual information system.	1. Purchase Order Number 2. Vendor Name 3. Vendor Number 4. Volume Ordered 5. Commodity or Part Ordered 6. Commodity Code 7. Unit Price 8. Order Date 9. Receipt Date 10. Receipt Date 11. Expense Amount	1. Purchase 2. Purchase Order/Vendor File 3. Purchase Order/Vendor List 4. Purchase Order 5. Purchase Order 6. Purchase Order/Commodity List 7. Purchase Order/Quote 8. Purchase Order 9. Purchase Order/Receiving Copy 10. Purchase Order/Receiving Copy 11. Purchase Order/Accounting Copy

EXHIBIT 36a

Issued to: _____

VENDOR FILE ACTIVITY REPORT

Report #: _____
For the Period ____ - ____

Vendor Number	Vendor Name	Vol. Ordered	Commodity Name	Commodity Code	Order Dates	Unit Price	Expense Amount
14 D	White Bearing	12	1" Bearing	604	2/3/81	1.30	15.60
		4	1" Bearing	604	4/1/81	1.33	5.32
		20	1" Bearing	604	5/11/81	1.33	26.60
	Total YTD	36	1" Bearing	604		1.32	47.52

EXHIBIT 37

VENDOR FILE ACTIVITY REPORT
(Semi-Annually or on Demand)

Report Use	Description	Key Data Elements	Data Element Source
Facility manager uses this report to: Identify orders which should be blanket or stock item purchases Identify opportunities for vendor consolidation Identify vendor disparities	A semi annual report which indicates the volume and dollar amount of purchases from each vendor. The report is sorted alphabetically by vendor with each commodity volume order listed and totaled by 6 month periods. Note: Summary cards by vendor may be maintained if EDP capabilities do not exist. Utility management should review each vendor card in lieu of this input.	1. Vendor Number 2. Vendor Name 3. Volume Offered 4. Commodity Name 5. Commodity Code 6. Order Date 7. Unit Price 8. Expense Amount	1. Purchase Order/Vendor File 2. Purchase Order 3. Purchase Order 4. Purchase Order 5. Purchase Order/Commodity List 6. Purchase Order 7. Purchase Order/Quote 8. Purchase Order/ Accounting Copy

EXHIBIT 37a

STOCK ACTIVITY REPORT

Report # _____
For the Period ___- ___

Issued to: _____ ___
_____
_____

Commodity Number	Reorder Point	Commodity Name	Beginning Balance		Purchases		Units Issued	Balance on Hand		Ending Inventory Balance
			Units	Unit Cost	Units	Unit Cost		Units	Unit Cost	
604	22	1" Bearings	4	1.29	20	1.33	19	8		$ 10.64

EXHIBIT 38

STOCK ACTIVITY REPORT

(Semi-Annually or on Demand)

Report Use	Description	Key Data Elements	Data Element Source
Facility manager uses this report to: Identify overstocked and understocked items Identify items which should be on hand in inventory rather than order materials Identify duplicate stock Determine value of inventory	A monthly report which shows the movement of inventory and stock items from the point of order through receipt and use. The report shows balances and value by commodity, and reorder point. Note: Summary cards by commodity may be maintained if EDP capabilities do not exist. Utility manager should review each card in lieu of this report.	1. Commodity Number 2. Reorder 3. Commodity Name 4. Beginning Balance Units 5. Beginning Balance Unit Cost 6. Purchased Units 7. Purchased Unit Costs 8. Issued Units 9. Balance on Hand Units 10. Balance on Hand Unit Cost 11. Ending Inventory Balance	1. Purchase Order/Vendor File 2. Inventory Ticket 3. Purchase Order 4. Prior Month Report 5. Prior Month Report 6. Purchase Order 7. Purchase Order/Quote 8. Inventory Ticket 9. Calculated 10. Calculated 11. Calculated

EXHIBIT 38a

Report # _____
For the Period ____ - ____

EMPLOYEE PROFILE

Issued to: _____
_____
_____

Name	Date of Hire	Career Profile Date	Career Profile Classification	Training Hours/Date	Training Course
M. L. Operator	12/9/73	12/9/73	Laborer I		
		2/8/74	Operator I	48	Sacremento
		6/30/75	Operator II	3/1/75	Certified Level I
				6/12/76	Certified Level II
		6/30/78	Operator III	7/18/78	Certified Level III
		7/30/80	Chief Operator	1/5/80	Certified Level IV
		8/1/81	Superintendent	6/30/80	3 cr hours Mech Eng
				12/31/80	3 cr hours Shop Mgmt
				6/30/80	3 cr hours Accounting
				6/30/81	3 cr hours Chemistry

EXHIBIT 39

EMPLOYEE PROFILE REPORT
(Semi-Annually or on Demand)

Report Use	Description	Key Data Elements	Data Element Source
Utility manager uses this report to: • Monitor employee development • Identify management trainees • Monitor personnel policy compliance • Identify training requirement • Match job requirements to classification level	A semi-annual report prepared by the utility clerical function which profiles the training and career, job development path of an employee. Employees are listed alphabetically with all historical data included for the length of the employees tenure. Note: This report is designed for a manual system. Each year can be an extension of the prior year report and a master sheet would be kept in each employee file.	1. Name 2. Date of Hire 3. Career Profile Date of Job 4. Career Profile Type Job Status Change 5. Training Hours 6. Training Course Title or description	1. Personnel File 2. Personnel File 3. Personnel File 4. Personnel File 5. Personnel File 6. Personnel File

EXHIBIT 39a

F. Management vs Electronic Data Processing

1. Defining Alternatives

The above sections have discussed utility management information needs and the types of data which address those needs. The types of systems used to record and accumulate the information can be ma..ual or automated or a combination of both.

- o Manual Data Processing is typical for the 15 - 20 mgd or less utilities. Some electronic data processing (EDP) may exist for such areas as billing, acccounting and budgeting but seldomly is EDP available for plant operations and maintenance systems. Most utilities are "Forms" oriented and month end reports are prepared by lab technicians, maintenance supervisors and operators.

- o Electronic Data Processing (EDP) is becoming more popular in utility operations and management. Some utilities utilize EDP to control purchases, record and maintain inventories etc. The intention of this section is to provide insight into alternatives and decisions required when considering EDP.

  Basically, there are two types of EDP a utility can consider:

  - Inhouse Computer - where the computer, terminals, printers programs and operators are on the premises supporting management needs. A further breakdown of choices exists as well, whether to buy packaged or develop inhouse software (programs).

    - oo Packaged Software - is generally available in the marketplace from a variety of vendors and depending on the compatability with the inhouse hardware, (computer, terminals, printers, etc.) may provide the types of data storage, manipulation and reporting desired.

oo Developed Software - is available from a consultant or specialized firm and is "tailor made" to the unique requirements of the system user (utility management).

- Service Bureau Support - or a service obtained from an outside concern. The service bureau generally picks up and processes utility data (batch type processing) or provides the utility with a computer terminal and printer to input and output their own data direct to/from the computer system (on-line type processing). In either case the utility generally "buys time" from the service bureau and avoids capital expense for hardware and software purchase and large operating expenses with personnel, supplies, insurance, security and related items. Exhibit 40 profiles some advantages and disadvantages of service bureau versus in-house EDP.

2. Types of Software

Regardless of the type of EDP service selected (inhouse or service bureau), the utility should obtain basic capabilities or program services (subsystems). The following is a list of capabilities currently available:

o Accounting Applications

- General ledger reflects in summary and in detail the financial position and results of operations of the utility.

- Encumbrance accounting reflects the obligations in the form of purchase orders, contracts or commitments which are chargeable to an appropriation and for which a part of an appropriation is reserved.

- Accounts payable reflects liabilities on open account owing for goods and services received by the utility.

- Accounts receivable reflects unpaid billing from residential, commercial and industrial users, as well as outstanding miscellaneous billings.

- Equipment records is a historical collection of the purchase price, description and cost history of wastewater works and equipment.

Advantages and Disadvantages of Service Bureaus vs. In-House Computer

ALTERNATIVE	ADVANTAGES	DISADVANTAGES
In-house computer	. Direct control over data processing operations . Direct control over implementing system changes and/or modifications . Direct control over processing schedules . Operating costs are relatively fixed varying based on the number of applications and related transaction volumes . Ability to add additional applications at minimal incremental costs.	• Requires own EDP staff • Substantial initial cost for hardware/software aquisition • Increased operating costs for -space -operating supplies -insurance • Recurring annual cost for hardware maintained and software licensing • Average life of hardware/software is 5-7 years before it becomes outmoded • Must develop operations, security and control procedures
Service Bureau	. Using hardware/software resources without significant initial investment . In-house EDP staff not required . Requires less management to control performance . No need to develop data processing operating standards, security procedures, control procedures	• No control over data processing operations • No control over implementing system changes and modifications • Little control over production schedules • As number of applications and/or transactions volumes of existing applications increase costs could become prohibitive

EXHIBIT 40

- o Personnel Applications

  - Payroll calculates the utility payroll and generates checks and registers and data for input to the general ledger.

  - Employee Profile provides storage of employee related data including date of hire, compensation and promotion history and training experience.

- o Utility Management Applications

  - Unit Process Tracking collects and stores various operating data such as influent and effluent volumes, process control measures, removal rates, etc. It provides the ability to report periodically by unit process and presents comparative trend analysis and related management reports.

  - Purchasing and Inventory is a purchase order driven inventory management system with standard parts listing of present and historical volumes and values, reorder points, etc. This application would include purchase order status tracking and provide accounting data as required.

3. The Selection Process and System Development

The evaluation of manual versus electronic data processing is a complex task. The basis for selection is a cost/benefit analysis of operating either system. This analysis is conducted based on the following two criteria:

- o What is the alternative's ability to satisfy user management information requirements?
- o What alternative satisfies the most user requirements for the least cost or most benefits?

As the following paragraphs explain, the cost/benefit analysis is very complex and it is suggested a third party (external to the potential hardware, software vendor and the utility) be contacted to assist in the many and varied technical areas.

In order to obtain the proper data to perform a cost/benefit analysis (as indicated in Exhibit 41), a series of steps must be performed; these steps are called System Development.

STEP I: Define Requirements - The analysis of the present system and identification of new system requirements. This step includes:

- Identification of system objectives (provide timely accurate management information);
- Definition of analytical benefits (labor savings, automation of user charge billing);
- Identification of major source records; inputs and reports; outputs (equipment records fixed asset inventory); and
- Description of available hardware and software to satisfy system requirements (printers, terminals, central processing).

STEP II: Review Available Resources - Consideration of in-house or service bureau. Major areas to review include:

- Sophistication of utility's data processing facilities information requirements;
- Availability of financial and personnel resources; and
- Degree of existing computerization.

STEP III: Prepare and Transmit Request for Proposal (RFP) - This would be conducted if the utility had little or no available computer resources or if the utility was not able to satisfy the information requirements as defined in Step I with the resources as outlined in Step II. The RFP is a tool to solicit proposals from vendors for products to meet the system requirements. Major elements of the RFP are listed in Exhibit 42.

STEP IV: Define Manual System Cost - Current or proposed manual system cost must be identified to provide a "benchmark" or comparative cost for analysis. These cost include:

- Manpower cost,
- Equipment cost,
- Forms cost, and
- Storage space cost.

EXHIBIT 41

COST/BENEFIT ANALYSIS

Manual vs. Alternatives of Electronic Data Processing

	1982	1983	1984 .... 198x
EDP Costs:			
Development (start-up)			
Third Party			
Equipment (hardware)			
Other One-Time Costs			
Recurring Costs:			
Personnel			
Supplies			
Fees, etc.	—	—	— —
Total Costs	—	—	— —
Cumulative Total Costs	=	=	= =
Manual Cost Savings or Benefits:*			
Personnel			
Rental/Service Bureau Charges			
Sale of Obsoleted Equipment			
Operating Savings	—	—	— —
Total Benefits/Savings	—	—	— —
Cumulative Benefits/Savings	=	=	= =
Discounted Cumulative Costs			
Discounted Cumulative Savings	—	—	— —
Net Cumulative Discounted Savings	=	=	= =

*from improved management information

EXHIBIT 42

RFP: Vendor Proposal Contents

1. Hardware description with complete specifications.

2. Detailed description of operating system, utility programs, and supported programming languages

3. Complete pricing - monthly and yearly costs

   - Recurring costs
   - Onetime costs

4. Growth capabilities of the proposed system

5. Vendor services

   - Field engineering
   - Systems engineering

6. References

   - Number of systems installed nationally, locally, locally within your industry
   - Three specific local references which can be interviewed

7. Description of the installation methodology the vendor would use to install the new system

   - Proposed delivery time
   - Software development if required
   - Installation and conversion assistance

8. Software Development

   - Estimated programming costs
   - Development time
   - If program packages are to be used, what is the flexibility of modifying and tailoring the programs?
   - How easily can the programs be upgraded and enhanced as requirements change?

9. Personnel and training requirements

   - Proposed education plan
   - Where are facilities located?
   - Assistance in obtaining qualified personnel

10. Description of testing and backup facilities

11. Manufacturer balance sheet

12. Sign-off, acceptance procedures

13. Contractual relationships

Consider not only first year expenses, but project the cost over a 5 - 7 year time frame.

STEP V: Vendor Proposal Evaluation - The selection of a vendor is based upon a comprehensive evaluation of the information contained in the vendor's proposal, the ability to demonstrate hardware and software (when appropriate), and the information obtained from reference checks of present users.

The following paragraphs contain guidelines for conducting this step of computer evaluation and selection.

o Initial Proposal Review

The objectives of the initial proposal review are to determine the degree of compliance with RFP instructions, identify missing items of information and to determine the scope of proposed hardware and software configuration in terms of size, potential implementation problems and costs. Review each proposal to determine the scope of the hardware and software configuration proposed. Eliminate from further consideration those vendors who have made an unreasonable offer compared to the other offers received.

o Vendor Elimination

Comprehensive evaluation of vendor is a laborious and complex process. The preceeding paragraphs described some techniques for eliminating vendors from further consideration. Additional vendors may be eliminated because they cannot meet the essential requirements described in the RFP.

o Demonstrations

Vendor demonstrations can provide valuable input to the review process because they allow the evaluators to observe whether or not a proposed feature or capability works as described in the vendor's proposal. The following guidelines may be helpful:

- Select the features and capabilities to be demonstrated based upon the contents of the vendors proposal;

- Communicate the requirements for a demonstration to the vendor in writing to avoid misunderstanding;

- Document the expected demonstration results prior to the demonstration; and
- Observe the demonstration and document the results.

STEP VI: Define Automated System Costs - A comprehensive cost analysis for each qualified vendor must be conducted. In evaluating the vendors consider both initial and operating cost for a period of 5 - 7 years as indicated below:

o Initial Costs

- Purchase price for hardware and software,
- Supplies,
- Freight,
- Site planning and preparation,
- Training, and
- Field engineering cost to install.

o Operating Costs

- Personnel (the number of individuals required to operate the system may vary for each configuration),

- Forms,

- Hardware maintenance,

- Software maintenance, and

- Hardware components (terminals, disk storage, etc.).

STEP VII: Manual Versus Automated System Cost Analysis

Exhibit 41 illustrates the system selection decision based on cost of manual versus electronic data processing. The 5 - 7 year cost projection should be discounted or reduced by a reasonable rate of interest over time to bring all data to present day value. The alternative which meets the most requirements for the least cost should be selected.

STEP VIII: Bring Development to Closure

If a manual system is selected, an implementation team should be developed. If an electronic data processing solution is selected, it is advisable to retain the services of an experienced management consultant.

Listed below are considerations for use in assessing contract terms between a computer vendor and yourself:

- Avoid artificial deadlines in developing schedules;
- Identify practical due dates where possible;
- Designate and delegate implementation responsibilities;
- Define, to the extent possible, specific deliverables and when they are due;
- Specify acceptance criteria and/or conditions under which testing occurs;
- Require all representations to be in writing;
- Define specific warrantee terms and durations of coverages;
- Specify default conditions and their results; Define and agree upon limitations of liability and/or recourse;
- Identify required/available training and other related support;
- Identify the nature and schedule for delivery of documentation; and
- Be sure to include both hardware and software cost and provide, if possible, hardware buy-back terms.